DOCUMENT RESUME

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ABSTRACT

In this activity, students look at different types of fabric and their respective individual properties. Using a magnifying glass and sandpaper, students test the weave and wear quality of sample fabrics. By comparing the qualities of different fabrics, they are able to better understand why there are so many different types of fabric and recognize or suggest different uses for them. This activity requires a 45-minute time period for completion. (Author/SOE)

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ED 480 785

Activity: **Compare Fabric Materials**

GRADE LEVELS: 3-5

SUMMARY:

Students will look at different types of fabric and their respective individual properties. Using a magnifying glass and sandpaper they will test the weave of fabrics and the wear quality of sample fabrics. By comparing the qualities of different fabrics they will better understand why there are so many different types of fabric and be able to recongnize or suggest different uses for them.

LEVEL OF DIFFICULTY [1 = Least Difficult: 5 = Most Difficult

4-difficult

TIME REQUIRED

30-45 minutes

COST

$5 or less depending on availibility of materials at school.

STANDARDS:

1.1 Identify materials used to accomplish a design task based on a specific property, i.e. weight, strength, hardness, and flexibility.

2.2 Describe different ways in which a problem can be represented, e.g., sketches, diagrams, graphic organizers, and lists.

WHAT WILL THE STUDENTS LEARN?

How to use a magnifying glass

The structure of fabric

Basic experimental testing skills

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BACKGROUND INFORMATION:

VOCABULARY:

WEAR: damage, destruction, or marks of use by scraping or rubbing

"WEAR AND TEAR": the loss or damage that occurs to something in the course of normal use

BREAKTHROUGH: a sudden advance in knowledge or technique; point when a hole is created through a barrier

SANDPAPER: paper with rough material (like sand) fixed on one side and used for smoothing and polishing

MAGNIFYING GLASS: a lens that magnifies objects viewed through it

FABRIC: a woven or knitted material/cloth

WEAVE: any pattern or method of weaving; to make on a loom by lacing together threads going lengthwise with threads going crosswise

THREAD: a thin fine cord formed by spinning and twisting short fibers into a continuous strand

FIBER: a slender and long natural or synthetic unit of material (like wool, cotton, asbestos, gold, glass, or rayon) usually able to be spun into yarn

SUMMARY OF NATURAL FIBERS:

Cotton comes from a cotton boll plant. Woven cloth made of cotton breathes freely, making it comfortable to wear in many kinds of weather. It can be sewn, woven, heated and pressed easily into flannel or used to make knit fabric. Linen is another type of natural fabric. Linen comes from a flax plant instead of a cotton ball plant. Linen wrinkles very easily, but is lightweight, for optimal use in hot weather. Silk is spun by silk worms and can be either smooth or rough. Finally, wool is made from animal hair.Fabric made of wool can provide tremendous warmth. Often, wool is combined with man-made fibers to make outdoor apparel for cold weather.

SUMMARY OF SYNTHETIC FIBERS:

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Polyester is an example of a synthetic fiber used to make cloth. Polyester was popular when first introduced because of the ease of cleaning, durability and wrinkle-free appearance. However, unlike cotton, fiber made of pure polyester does not breath freely, trapping body heat and moisture, which can make it uncomfortable. Rayon is a more delicate fabric, but its soft draping quality can look like linen. Rayon is more absorbant than polyester, so it is more comfortable to wear. Another fabric, nylon is often a part of many fabrics that stretch, like undergarments and swim suits. Acrylic is another material that can be made into fabric. Acrylic can be used as a wool substitute, since it is warm and does not wrinkle easily. Often, acrylic is found in winter outdoor apparel.

For a more challenging activity, a discussion about the types of fabric and their various weave designs can be included.

RESOURCES:

www.hollandandsherry.com/textileguide/fabrics.html - good descriptions of different types of fabric

www.utexas.edu/depts/bbr/natfiber - provides links to sites dealing with natural fibers

www.wholeearthmag.com/ArticleBin/113.html - gives descriptions of different synthetic fibers

www.fpsmith.com/weaves1.htm - describes different types of weaves

MATERIALS: (per group)

magnifying glass

three different pieces of fabric (i.e. nylon stocking, light weight cotton, denim)

baseball or heavy ball

extra coarse sandpaper

rubber band

PREPARATION:

Obtain materials

Cut each fabric into 4 ¼" x 11" pieces.

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Photocopy the "Fabric Wear and Tear" chart. (See link)

DIRECTIONS:

Part One: Observation

1. Put studnets in groups of two.
2. Give each group one piece of each type of fabric.
3. Have the students use a magnifying glass to look closely at each fabric.
4. Instruct each group to draw what each fabric weave looks like on the data sheet.

Part Two: Fabric Wear and Tear

5. Give each group a baseball or heavy ball.
6. Have each group wrap one of their pieces of fabric tightly around the ball and secure with a rubber band. (Note: The tighter the fabric is, the faster the experiment progress.)
7. Within each group, one partner should secure a piece of sandpaper (rough side up), while the other partner drags the ball across it. DO NOT PRESS DOWN on the ball; let the weight of the ball drag once across the sandpaper.
8. Student should use the magnifying glass to observe the area where the fabric was dragged across the sandpaper. Question for discussion: Was there any wear after just one scrape?
9. Students should continue to test the fabric one scrape at a time. After each successive scrape, examine the area with the magnifying glass, counting each scrape until you notice some wear on the fabric. Make a tick mark on the data sheet for each scrape.
10. When students notice some wear on the fabric, have them count and record the number of scrapes in the chart under "First Wear" for the tested fabric.
11. Have the students continue scraping the fabric and counting each scrape until they notice a hole or tear.
12. Record the number of scrapes in the chart under "Breakthrough" for that fabric.

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13. Repeat steps 6 -12 for each of the other two fabrics.

INVESTIGATING QUESTIONS:

What makes fabrics different?

Which fabrics are the strongest?

Why do certain parts of your clothes, such as the knees of pants or the elbows of shirts, wear faster than other parts?

Which fabric needed the most scrapes to show the first signs of wear?

Which fabric needed the least scrapes to show the first signs of wear?

Which fabric lasted the longest between the first signs of wear and the breakthrough point?

Which fabric qualities do you think were the most important for the durability of the fabric (e.g. type of fiber in the thread, strength of the thread, type or tightness of the weave)?

REFERENCES:

Richards, Roy. An Early Start to Technology from Science. London: Simon & Schuster, 1990, pp. 66-67.

The Best of WonderScience: Elementary Science Activities. Albany: Delmar Publishers, 1997, pp. 110.*

A Beginner's Guide to Fabrics. Online. http://www.cranstonvillage.com/library/l-f-fabg.htm. [24 July 2001].

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Rubric for Performance Assessment

Activity Title: Compare Fabric Materials

Grade Level: PK-2

	1	2	3	4		
Criteria	Beginning	Developing	Proficient	Advanced	Weight (X factor)	Subtotal
Completion of experiment	Completes few tests	Completes most tests.	Performs test properly for all three fabrics.	Performs all tests properly, carefully, and efficiently.		
Drawings	Do not show the weave of the fabric, shows no evidence of magnifying glass use.	Weave is poorly drawn.	Shows weave drawn reasonable, shows evidence of proper magnifying glass use.	Weave is drawn very accurately and with great detail.		
Data collection	No data collected	Incomplete data; careless write up	Data is easy to read and understand; regular readings recorded.	Draws conclusions from data; neat and carefully designed.		
					Total:	

Teacher Comments:

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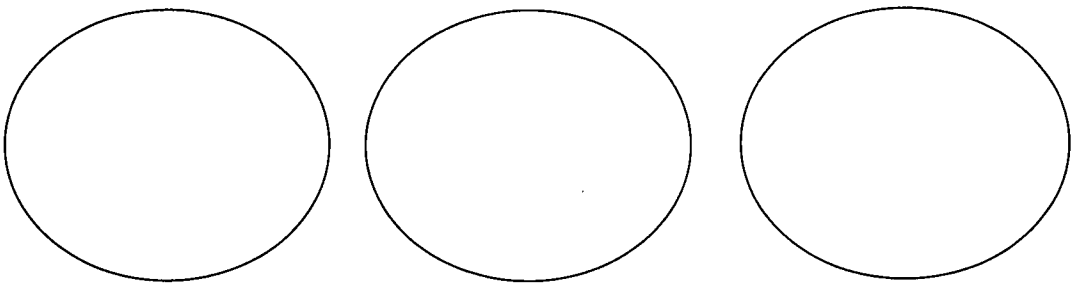
Name _____

Date _____

PART 1: Observation

Fabric 1 Fabric 2 Fabric 3



PART 2: Fabric Wear and Tear

Fabric Wear and Tear

	Type of Fabric	Number of Scrapes	
		First Wear	Breakthrough
1			
2			
3			

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PreK-12 ENGINEERING

Activity Evaluation Form www.k12engineering.org

Activity Name: _____

Grade Level the Activity was implemented at:_____

Was this Activity effective at this grade level (if so, why, and if not, why not)?

What were the Activity's strong points?

What were its weak points?

Was the suggested Time Required sufficient (if not, which aspects of the Activity took shorter or longer than expected)?

Was the supposed Cost accurate (if not, what were some factors that contributed to either lower or higher costs)?

Do you think that the Activity sufficiently represented the listed MA Framework Standards (if not, do you have suggestions that might improve the Activity's relevance)?

Was the suggested Preparation sufficient in raising the students' initial familiarity with the Activity's topic (if not, do you have suggestions of steps that might be added here)?

If there were any attached Rubrics or Worksheets, were they effective (if not, do you have suggestions for their improvement)?

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I. DOCUMENT IDENTIFICATION:

Title: PreK-12 Engineering Activities

1) Touch and Discover, Grades PreK-2
http://www.prek-12engineering.org/data/d2/Touchdiscover.pdf

2) Invent a Backscratcher from Everyday Materials, Grades PreK-2
http://www.prek-12engineering.org/data/d28/Backscratcher.pdf

3) Compare Human-Made Objects with Natural Objects, Grades PreK-5
http://www.prek-12engineering.org/data/d34/HumanvsNatural.pdf

4) Do Different Colors Absorb Heat Better?, Grades PreK-2
http://www.prek-12engineering.org/data/d37/Absorbheat.pdf

5) Which Roof is Tops?, Grades PreK-2
http://www.prek-12engineering.org/data/d44/RoofTops.pdf

6) Make Your Own Recycled Paper, Grades PreK-2
http://www.prek-12engineering.org/data/d56/Recycle.pdf

7) Build an Approximate Scale Model of an Object Using LEGOs, Grades 3-5
http://www.prek-12engineering.org/data/d3/LegoScaleModel.pdf

8) Design Weather Instruments using Lego Sensors, Grades 3-5
http://www.prek-12engineering.org/data/d4/LegoWeather.pdf

9) Space Shelter, Grades 3-5
http://www.prek-12engineering.org/data/d5/SpaceShelter.pdf

10) Build a Bird House, Grades 3-5
http://www.prek-12engineering.org/data/d6/BirdHouse.pdf

11) Ball Bounce Experiment, Grades 3-5
http://www.prek-12engineering.org/data/d6/BallBounce.pdf

12) Make an Alarm!, Grades 3-5
http://www.prek-12engineering.org/data/d11/MakeAlarm.pdf

13) Design Packing to Safely Mail Raw Spaghetti, Grades 3-5
http://www.prek-12engineering.org/data/d17/MailSpaghetti.pdf

14) Disassemble a Click Pen, Grades 3-5
http://www.prek-12engineering.org/data/d33/clickPen.pdf

15) Construct And Test Roofs for Different Climates, Grades 3-5
http://www.prek-12engineering.org/data/d35/ClimateRoof.pdf

16) Compare Fabric Materials, Grades 3-5
http://www.prek-12engineering.org/data/d36/Fabric.pdf

17) A House is a House for Me, Grades 3-5
http://www.prek-12engineering.org/data/d52/House.pdf

18) Water Filtration, Grades 3-5
http://www.prek-12engineering.org/data/d53/Water Filtration.pdf

19) What is the Best Insulator: Air, Styrofoam, Foil, or Cotton?, Grades 3-5
http://www.prek-12engineering.org/data/d54/BestInsulator.pdf

20) Design a Recycling Game!, Grades 3-5
http://www.prek-12engineering.org/data/d55/Recycling.pdf

21) Tower Investigation and the Egg, Grades 6-8
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22) Wimpy Radar Antenna!, Grades 6-8
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23) Portable Sundial, Grades 6-8
http://www.prek-12engineering.org/data/d30/PortableSundial.pdf

24) An Introduction To Loads Acting on Structures, Grades 6-8
http://www.prek-12engineering.org/data/d31/IntroLoads.pdf

25) Design Your Own Rube Goldberg Machine, Grades 6-8
http://www.prek-12engineering.org/data/d32/RubeGoldberg.pdf

26) Building Tetrahedral Kites, Grades 6-8
http://www.prek-12engineering.org/data/d38/tetrakites.pdf

27) Do as the Romans: Construct an Aqueduct!, Grades 6-8
http://www.prek-12engineering.org/data/d39/Aqueduct.pdf

28) Build an Earthquake City!!, Grades 6-8
http://www.prek-12engineering.org/data/d40/EarthquakeCity.pdf

29) Design a Parachute, Grades 6-8
http://www.prek-12engineering.org/data/d41/Parachute.pdf

30) The Squeeze is On, Grades 6-8
http://www.prek-12engineering.org/data/d42/Squeeze.pdf

31) Stop The Stretching, Grades 6-8
http://www.prek-12engineering.org/data/d43/StopStretching.pdf

32) Speaker Project, Grades 9-10
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